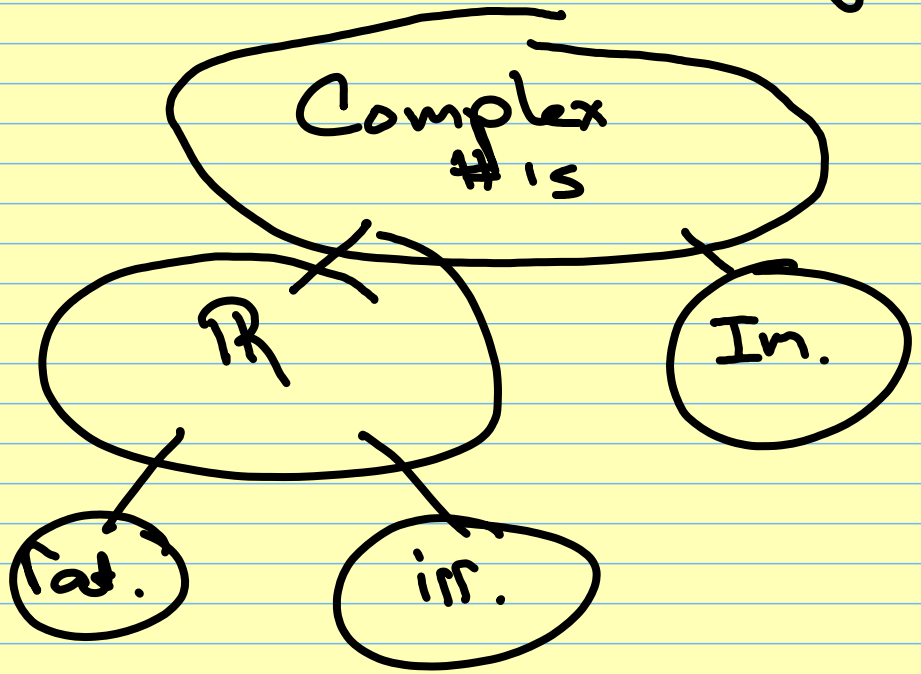
20.2: Complex Numbers

- Defn: A Complex # is any number that can be expressed in the form $a+bi$, where a and b are real #s and i is the imaginary unit

$\underbrace{a}_{\mathbb{R}} + \underbrace{bi}_{\text{Imaginary}}$ ⇒ Combination of a real # and an imaginary #

Ex: $4+2i$; $\frac{1}{2}-\frac{5}{4}i$; $3+i\sqrt{2}$ or $3+\sqrt{2}\,i$

Complex #'s encompass the complete set of real #'s and imaginary #'s

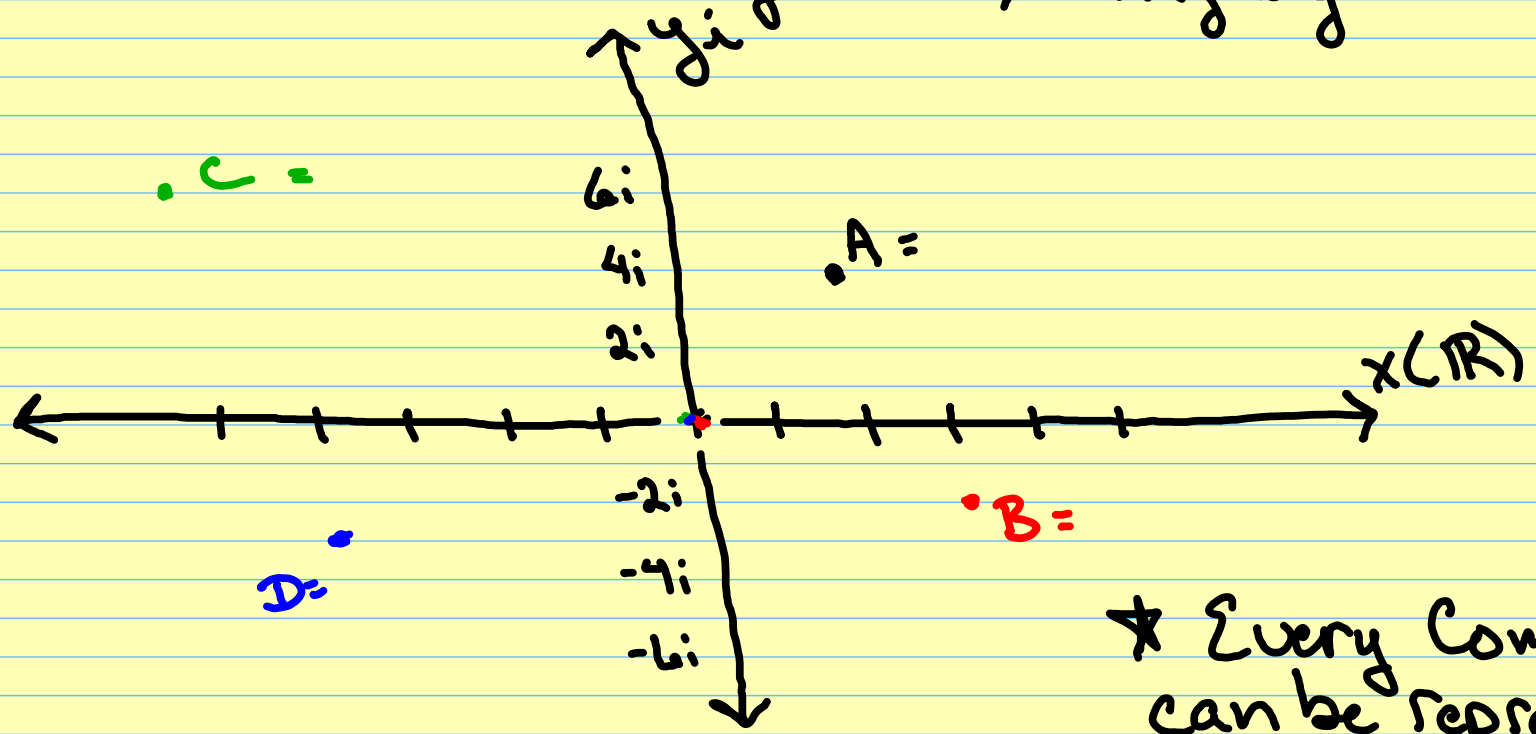


R: 2 is really

Im. 2i is really

Complex Plane : x-axis ⇒ ℝ (real axis)

y-axis ⇒ Imaginary



★ Every Complex # can be represented by a point or as a vector in the Complex Plane.

Modulus (or length) of a complex number; $|a+bi|$:

distance from the origin

$$|a+bi| = \sqrt{a^2+b^2}$$

Ex: $|2-3i| =$

Equality of Complex #'s: 2 complex #'s are equal if and only if their real and imaginary components are equal

$a+bi = c+di$ iff $a=c$ and $b=d$

Ex: Find x and y if $2+5i = x+(2+y)i$

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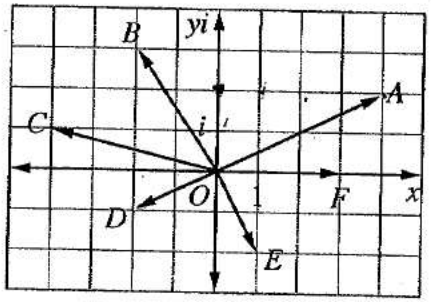
EXERCISES WITH OPEN-RESPONSE PROBLEMS

In 1–6, in each case: **a.** Write the complex number represented by the vector drawn in the accompanying diagram. **b.** Find the length of each vector.



1. $\overrightarrow{OA}$
2. $\overrightarrow{OB}$
3. $\overrightarrow{OC}$
4. $\overrightarrow{OD}$
5. $\overrightarrow{OE}$
6. $\overrightarrow{OF}$

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